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9 September 1992

Mr. Wayde Hartwick
Remedial Project Manager
U.S. Environmental Protection Agency
77 West Jackson Boulevard
Chicago, Illinois 60604

U.S. EPA Contract No.: 68-W8-0089

Work Assignment No.: 09-5PJ7/American Chemical Services

Document Control No.: 4500-09-AFVD

Subject: Human Health Risk-Based Cleanup Levels

Dear Mr. Hartwick:

As you requested in our 4 September 1992 phone conversation, Roy F. Weston, Inc. (WESTON®) has revised the tables of human health risk-based cleanup levels for the American Chemical Services (ACS) site in Griffith, Indiana. The tables submitted to you on 2 September 1992 have been revised as necessary with respect to the following three issues:

- Risk-based cleanup levels derived from future on-site resident exposure to the lower aquifer have been added to Table 2.
- Soil Response Action Levels based on migration to groundwater have been derived from both future and current exposure to the upper aquifer, and included in Tables 3, 4, 5, 6, 7, and 8.
- All risk-based cleanup levels based on current use of the site as described in the original risk assessment were provided in the tables as submitted on 2 September 1992.

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If you have any questions or comments, please do not hesitate to call.

Very truly yours,

ROY F. WESTON, INC.

Thomas P. Graan
Risk Assessment Specialist

James M. Burton, P.E.
Site Manager

TPG:JMB:ll

Attachments

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Table 1

Human Health Risk-Based Groundwater Cleanup Standards: Upper Aquifer
American Chemical Services Site
Griffith, Indiana

Chemical	Reasonable Maximum Exposure Point Concentration (mg/L)	CLP Contract Required Quantitation Limit (CRQL) (mg/L)	Background Concentration (mg/L)	Maximum Contaminant Level (MCL) (mg/L)	Proposed MCL (mg/L)	Risk-Based Cleanup Level[1] (mg/L)	
						Future On-Site Resident	Current Off-Site Resident
Part A - Carcinogenic							
Benzene	100	0.01	—	0.005	—	0.0019	0.0077
Vinyl Chloride	0.72	0.01	—	0.002	—	0.000034	0.00025
total PCBs	0.0296	0.001	—	0.0005	—	0.0000039	0.000062
bis(2-Chloroethyl)ether	0.25	0.01	—	—	—	0.00006	0.021
Arsenic*	0.0432	0.01[2]	—	0.05[3]	—	0.000045	0.0088
Tetrachloroethene	0.2	0.01	—	0.005	—	0.0013	0.008
Methylene Chloride	0.38	0.01	—	0.005	—	0.0053	0.0093
Chloromethane	0.068	0.01	—	—	—	0.004	0.0084
Beryllium	0.00025	0.005[2]	—	0.004	—	0.000018	—
Trichloroethene	0.045	0.01	—	0.005	—	0.0041	0.024
bis(2-Ethylhexyl)phthalate	0.05	0.01	—	0.006	—	0.0058	—
Cyclic Ketones	0.092	—	—	—	—	0.014	0.0058
Pentachlorophenol	0.003	0.025	—	0.001	—	0.0068	—
1,4-Dichlorobenzene	0.01	0.01	—	0.075	—	0.0033	—
Isophorone	0.035	0.01	—	—	—	0.0019	—
Part B - Noncarcinogenic							
2-Butanone	220	0.01	—	—	—	1.4	24
4-Methyl-2-pentanone	54	0.01	—	—	—	0.71	0.64

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Table 1 (Continued)

Human Health Risk-Based Groundwater Cleanup Standards: Upper Aquifer
American Chemical Services Site
Griffith, Indiana

Chemical	Reasonable Maximum Exposure Point Concentration (mg/L)	CLP Contract Required Quantitation Limit (CRQL) (mg/L)	Background Concentration (mg/L)	Maximum Contaminant Level (MCL) (mg/L)	Proposed MCL (mg/L)	Risk-Based Cleanup Level[1] (mg/L)	
						Future On-Site Resident	Current Off-Site Resident
Non-Cyclic Acids	1.1	—	—	—	—	0.024	0.28
Acetone	99	0.01	—	—	—	2.9	2.3
Branched Alkanes	0.72	—	—	—	—	—	0.21
Ethylbenzene	1.1	0.01	—	0.7	—	—	0.39
Thallium	0.004	0.01[2]	—	0.002	—	0.0024	—
Dimethyl Ethyl Beazenes	0.4	—	—	—	—	—	0.25
1,2-Dichloroethene (cis)	0.4	0.01	—	0.07	—	0.29	0.33
Manganese	4.25	0.015[2]	0.31	—	—	3.3	—
4-Methylphenol	2.2	0.01	—	—	—	1.7	—
Arsenic*	0.0432	0.01[2]	—	0.05[3]	—	0.036	—
1,1-Dichloroethane	2.4	0.01	—	—	—	2.2	—

* Chemical appears in both Part A and Part B of table.
[1] Cleanup level is based either on carcinogenic risk (Part A of table) or on noncarcinogenic risk (Part B of table).
[2] Contract Required Detection Limit (CRDL).
[3] MCL under review.

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Table 2

Human Health Risk-Based Groundwater Cleanup Standards: Lower Aquifer
American Chemical Services Site
Griffith, Indiana

Chemical	Reasonable Maximum Exposure Point Concentration (mg/L)	CLP Contract Required Quantitation Limit (CRQL) (mg/L)	Background Concentration (mg/L)	Maximum Contaminant Level (MCL) (mg/L)	Risk-Based Cleanup Level (mg/L)	
					Future On-Site Resident	Current Off-Site Resident
Part A - Carcinogenic						
Arsenic	0.0086	0.01[2]	0.0024	0.05[3]	4.5E-05	5.7E-05
bis(2-Chloroethyl)ether	0.012	0.01	—	—	6.0E-05	8.6E-05
Part B - Noncarcinogenic						
N/A						

N/A - Not applicable.

[1] Cleanup level is based either on carcinogenic risk (Part A of table) or on noncarcinogenic risk (Part B of table).
[2] Contract Required Detection Limit (CRDL).
[3] MCL under review.

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Table 3

Human Health Risk-Based Soil Cleanup Standards Based on Oral and Dermal Exposure: Kapica-Pazmey (Surface)
American Chemical Services Site
Griffith, Indiana

Chemical	Reasonable Maximum Exposure Point Concentration (mg/kg)	CLP Low Level Contract Required Quantitation Limit (CRQL) (mg/kg)	Background Concentration (mg/kg)	Organic Carbon Partition Coefficient (K_{oc})[1] (L/kg)	Soil Response Action Level Based on Migration to Groundwater[2] (mg/kg) (MCL/Risk 1/Risk 2)	Risk-Based Cleanup Level[3] (mg/kg)	
						Future On-Site Resident	Current Child Trespasser
Part A - Carcinogenic							
total PCBs[4]	329	0.033	—	2,630,000	26/0.20/3.2	0.0084	0.07
total CPAHs[5]	14	0.33	—	1,950,000	7.8/ND/ND	0.0026	0.02
Tetrachloroethene*	790	0.01	—	363	0.036/0.0094/0.058	1.1	9.2
bis(2-Ethylhexyl)phthalate*	540	0.33	—	100,000	12/12/8,400	1.1	8.6
Aldrin	0.088	0.0017	—	407	NA/ND/ND	0.0018	0.014
Trichloroethene	170	0.01	—	126	0.012/0.010/0.060	5.3	42
Isophorone	97	0.33	—	30.9	NA/0.0012/2.0	7.5	57
Styrene	23	0.01	—	741	1.5/ND/ND	1.8	14
Pentachlorophenol	1.5	0.8	—	912	0.018/0.12/0.75	0.44	—
Benzene	3.2	0.01	—	100	0.010/0.0038/0.015	1.0	—
4,4'-DDD	0.15	0.0033	—	43,600	NA/ND/ND	0.12	—
Part B - Noncarcinogenic							
Antimony	84.8	12[6]	9.7	NA	—/—/—	15	40
bis(2-Ethylhexyl)phthalate*	540	0.33	—	100,000	12/12/8,400	130	340
Toluene	19,000	0.01	—	151	3.0/17/45	5,000	14,000
Cadmium	174	1.0[6]	2.64	NA	—/—/—	51	130

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Table 3 (Continued)

Human Health Risk-Based Soil Cleanup Standards Based on Oral and Dermal Exposure: Kapica-Pazmey (Surface)
American Chemical Services Site
Griffith, Indiana

Chemical	Reasonable Maximum Exposure Point Concentration (mg/kg)	CLP Low Level Contract Required Quantitation Limit (CRQL) (mg/kg)	Background Concentration (mg/kg)	Organic Carbon Partition Coefficient (K_{oc})[1] (L/kg)	Soil Response Action Level Based on Migration to Groundwater[2] (mg/kg) (MCL/Risk 1/Risk 2)	Risk-Based Cleanup Level[3] (mg/kg)	
						Future On-Site Resident	Current Child Trespasser
Ethylbenzene	4,300	0.01	—	257	3.6/2.0/2.0	1,300	3,300
Tetrachloroethene*	790	0.01	—	363	0.036/0.0094/0.058	250	660
Barium	5,730	40[6]	72.2	NA	---/—/—	2,600	—
Chromium (VI)	3,080	2.0[6]	17.8	NA	—/—/—	1,400	—
Naphthalene	97	0.33	—	3,310	NA/9.2/860	88	—

* Chemical appears in both Part A and Part B of table.

NA - K_{oc} or MCL not available.
ND - Chemical not detected in groundwater.

1 Source: Montgomery, John H. Groundwater Chemicals Desk Reference, Volumes I and II. Lewis Publishers. 1991.
2 Chemical concentration in soil at equilibrium with groundwater, when groundwater concentration is at MCL or risk-based cleanup level. Risk 1 is based on future use of upper aquifer. Risk 2 is based on current use of upper aquifer. Mathematically, Soil Response Action Level = (MCL or Risk-Based Groundwater Cleanup Level) x K_{oc} x f_{oc}. Calculation assumes 2 percent organic carbon content for site soils. If two risk-based groundwater cleanup levels were available for a chemical (i.e., carcinogenic and noncarcinogenic), the carcinogenic level was used in the calculation.
3 Cleanup level is based either on carcinogenic risk (Part A of table) or on noncarcinogenic risk (Part B of table).
4 K_{oc} based on Aroclor 1260.
5 K_{oc} and MCL based on Benzo(a)pyrene.
6 Contract Required Detection Limit (CRDL).

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Table 4

Human Health Risk-Based Soil Cleanup Standards Based on Oral and Dermal Exposure: Kapica-Pazmey (All Depths)
American Chemical Services Site
Griffith, Indiana

Chemical	Reasonable Maximum Exposure Point Concentration (mg/kg)	CLP Low Level Contract Required Quantitation Limit (CRQL) (mg/kg)	Background Concentration (mg/kg)	Organic Carbon Partition Coefficient (K_{oc})[1] (L/kg)	Soil Response Action Level Based on Migration to Groundwater[2] (mg/kg) (MCL/Risk 1/Risk 2)	Risk-Based Cleanup Level[3] (Future On-Site Resident) (mg/kg)
Part A - Carcinogenic						
total PCBs[4]	93.5	0.033	—	2,630,000	26/0.20/3.2	0.0085
total CPAHs[5]	14.2	0.33	—	1,950,000	7.8/ND/ND	0.0026
Tetrachloroethene*	790	0.01	—	363	0.036/0.0094/0.058	1.1
bis(2-Ethylhexyl)phthalate*	540	0.33	—	100,000	12/12/8,400	1.1
Styrene	260	0.01	—	741	1.5/ND/ND	1.7
Trichloroethene	250	0.01	—	126	0.012/0.010/0.060	5.3
Pentachlorophenol	16	0.8	—	912	0.018/0.12/0.75	0.44
Benzene	23	0.01	—	100	0.010/0.0038/0.015	1.0
2,4-Dinitrotoluene	0.84	0.33	—	61.7	NA/ND/ND	0.044
Aldrin	0.0228	0.0017	—	407	NA/ND/ND	0.0018
Isophorone	97	0.33	—	30.9	NA/0.0012/2.0	7.5
1,1-Dichloroethene	0.79	0.01	—	64.6	0.0090/ND/ND	0.098
Part B - Noncarcinogenic						
Antimony	84.8	12[6]	9.7	NA	—/—/—	15
bis(2-Ethylhexyl)phthalate*	540	0.33	—	100,000	12/12/8,400	130
Toluene	19,000	0.01	—	151	3.0/17/45	5,000
Cadmium	174	1.0[6]	2.64	NA	—/—/—	51

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Table 4 (Continued)

Human Health Risk-Based Soil Cleanup Standards Based on Oral and Dermal Exposure: Kapica-Pazmey (All Depths)
American Chemical Services Site
Griffith, Indiana

Chemical	Reasonable Maximum Exposure Point Concentration (mg/kg)	CLP Low Level Contract Required Quantitation Limit (CRQL) (mg/kg)	Background Concentration (mg/kg)	Organic Carbon Partition Coefficient (K_{oc})[1] (L/kg)	Soil Response Action Level Based on Migration to Groundwater[2] (mg/kg) (MCL/Risk 1/Risk 2)	Risk-Based Cleanup Level[3] (Future On-Site Resident) (mg/kg)
Ethylbenzene	4,300	0.01	—	257	3.6/2.0/2.0	1,300
Tetrachloroethene*	790	0.01	—	363	0.036/0.0094/0.058	250
Barium	5,730	40[6]	72.2	NA	—/—/—	2,600
Chromium (VI)	3,080	2.0[6]	17.8	NA	—/—/—	1,400
Naphthalene	97	0.33	—	3,310	NA/9.2/860	88

* Chemical appears in both part A and Part B of table.

NA - K_{oc} or MCL not available.
ND - Chemical not detected in groundwater.

1 Source: Montgomery, John H. Groundwater Chemicals Desk Reference, Volumes I and II. Lewis Publishers. 1991.
2 Chemical concentration in soil at equilibrium with groundwater, when groundwater concentration is at MCL or risk-based cleanup level. Risk 1 is based on future use of upper aquifer. Risk 2 is based on current use of upper aquifer. Mathematically, Soil Response Action Level = (MCL or Risk-Based Groundwater Cleanup Level) x K_{oc} x f_{oc}. Calculation assumes 2 percent organic carbon content for site soils. If two risk-based groundwater cleanup levels were available for a chemical (i.e., carcinogenic and noncarcinogenic), the carcinogenic level was used in the calculation.
3 Cleanup level is based either on carcinogenic risk (Part A of table) or on noncarcinogenic risk (Part B of table).
4 K_{oc} based on Aroclor 1260.
5 K_{oc} and MCL based on Benzo(a)pyrene.
6 Contract Required Detection Limit (CRDL).

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Table 5

Human Health Risk-Based Soil Cleanup Standards Based on Oral and Dermal Exposure: Still Bottoms, Treatment Lagoons
American Chemical Services Site
Griffith, Indiana

Chemical	Reasonable Maximum Exposure Point Concentration (mg/kg)	CLP Low Level Contract Required Quantitation Limit (CRQL) (mg/kg)	Background Concentration (mg/kg)	Organic Carbon Partition Coefficient (K_{oc})[1] (L/kg)	Soil Response Action Level Based on Migration to Groundwater[2] (mg/kg) (MCL/Risk 1/Risk 2)	Risk-Based Cleanup Level[3] (Future On-Site Resident) (mg/kg)
Part A - Carcinogenic						
Total PCBs[4]	158	0.033	—	2,630,000	26/0.20/3.2	0.0083
Carbon Tetrachloride*	3,600	0.01	—	436	0.044/ND/ND	0.38
bis(2-Chloroethyl)ether	110	0.33	—	14	NA/1.7E-05/0.0059	0.027
bis(2-Ethylhexyl)phthalate*	2,600	0.33	—	100,000	12/12/8,400	1.1
Tetrachloroethene*	1,600	0.01	—	363	0.036/0.0094/0.058	1.1
total CPAHs[5]	1.47	0.33	—	1,950,000	7.8/ND/ND	0.0026
Isophorone	2,600	0.33	—	30.9	NA/0.0012/2.0	7.2
4,4'-DDT*	28	0.0033	—	1,820,000	NA/ND/ND	0.088
Chloroform*	2,100	0.01	—	43.6	0.087/ND/ND	9.5
Benzene	170	0.01	—	100	0.010/0.0038/0.015	1.0
Pentachlorophenol	64	0.8	—	912	0.018/0.12/0.75	0.43
Hexachlorobutadiene*	40	0.33	—	4,680	NA/ND/ND	0.36
Styrene	160	0.01	—	741	1.5/ND/ND	1.8
1,2-Dichloroethane	40	0.01	—	19	0.0019/ND/ND	0.64
Methylene Chloride	380	0.01	—	8.7	0.00087/0.00092/0.0016	6.2
1,2-Dichloropropane	22	0.01	—	51	0.0051/ND/ND	0.44
Hexachlorobenzene	0.716	0.33	—	34,700	0.69/ND/ND	0.018

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Table 5 (Continued)

Human Health Risk-Based Soil Cleanup Standards Based on Oral and Dermal Exposure: Still Bottoms, Treatment Lagoons
American Chemical Services Site
Griffith, Indiana

Chemical	Reasonable Maximum Exposure Point Concentration (mg/kg)	CLP Low Level Contract Required Quantitation Limit (CRQL) (mg/kg)	Background Concentration (mg/kg)	Organic Carbon Partition Coefficient (K_{oc})[1] (L/kg)	Soil Response Action Level Based on Migration to Groundwater[2] (mg/kg) (MCL/Risk 1/Risk 2)	Risk-Based Cleanup Level[3] (Future On-Site Resident) (mg/kg)
gamma-BHC (Lindane)	1.1	0.0017	—	3,310	0.013/ND/ND	0.046
Cyclic Ketones	160	0.33	—	30.9	NA/0.0087/0.0036	7.3
1,1,2-Trichloroethane	8.1	0.01	—	56.2	0.0056/ND/ND	0.51
n-Nitrosodiphenylamine	13	0.33	—	575	NA/ND/ND	12
Part B - Noncarcinogenic						
Carbon Tetrachloride*	3,600	0.01	—	436	0.044/ND/ND	15
Nitrogenated Benzenes	250	0.33	—	229	NA/ND/ND	6.4
n-Chain Alkanes	23,000	—	—	NA	—/—/—	770
bis(2-Ethylhexyl)phthalate*	2,600	0.33	—	100,000	12/12/8,400	130
1,1,1-Trichloroethane	21,000	0.01	—	151	0.60/ND/ND	2,300
Naphthalene	750	0.33	—	3,310	NA/9.2/860	84
Chloroform*	2,100	0.01	—	43.6	0.087/ND/ND	250
Branched Alkanes	5,900	—	—	NA	NA/ND/ND	770
Ethylbenzene	8,400	0.01	—	257	3.6/2.0/2.0	1,300
Tetrachloroethene*	1,600	0.01	—	363	0.036/0.0094/0.058	250
Toluene	23,000	0.01	—	151	3.0/17/45	5,000
4,4'-DDT*	28	0.0033	—	1,820,000	NA/ND/ND	6.4
Antimony	46.6	12[6]	9.7	NA	—/—/—	15

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Table 5 (Continued)

Human Health Risk-Based Soil Cleanup Standards Based on Oral and Dermal Exposure: Still Bottoms, Treatment Lagoons
American Chemical Services Site
Griffith, Indiana

Chemical	Reasonable Maximum Exposure Point Concentration (mg/kg)	CLP Low Level Contract Required Quantitation Limit (CRQL) (mg/kg)	Background Concentration (mg/kg)	Organic Carbon Partition Coefficient (K_{oc})[1] (L/kg)	Soil Response Action Level Based on Migration to Groundwater[2] (mg/kg) (MCL/Risk 1/Risk 2)	Risk-Based Cleanup Level[3] (Future On-Site Resident) (mg/kg)
4-Methyl-2-pentanone	1,500	0.01	—	6.2	NA/0.088/0.079	630
Cadmium	118	1.0[6]	2.64	NA	—/—/—	51
Methyl Propyl Benzenes	1,100	—	—	2,820	NA/24/7.9	500
Halogenated Alkanes	4,800	0.01	—	151	0.60/7.1/1.8	2,300
Endosulfan I	1.2	0.0033	—	2,040	NA/ND/ND	0.63
Hexachlorobutadiene*	40	0.33	—	4,680	NA/ND/ND	25
Dimethyl Ethyl Benzenes	1,900	0.01	—	257	3.6/1.3/1.3	1,300
1,2-Dichloroethene (cis)[7]	320	0.01	—	59	0.082/0.34/0.39	250

* Chemical appears in both Part A and Part B of table.

NA - K_{oc} or MCL not available.
ND - Chemical not detected in groundwater.

1 Source: Montgomery, John H. Groundwater Chemicals Desk Reference, Volumes I and II. Lewis Publishers. 1991.
2 Chemical concentration in soil at equilibrium with groundwater, when groundwater concentration is at MCL or risk-based cleanup level. Risk 1 is based on future use of upper aquifer. Risk 2 is based on current use of upper aquifer. Mathematically, Soil Response Action Level = (MCL or Risk-Based Groundwater Cleanup Level) x K_{oc} x f_{oc}. Calculation assumes 2 percent organic carbon content for site soils. If two risk-based groundwater cleanup levels were available for a chemical (i.e., carcinogenic and noncarcinogenic), the carcinogenic level was used in the calculation.
3 Cleanup level is based either on carcinogenic risk (Part A of table) or on noncarcinogenic risk (Part B of table).
4 K_{oc} based on Aroclor 1260.
5 K_{oc} and MCL based on Benzo(a)pyrene.
6 Contract Required Detection Limit (CRDL).
7 K_{oc} based on trans isomer.

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Table 6

Human Health Risk-Based Soil Cleanup Standards Based on Oral and Dermal Exposure: On-Site Containment Area
American Chemical Services Site
Griffith, Indiana

Chemical	Reasonable Maximum Exposure Point Concentration (mg/kg)	CLP Low Level Contract Required Quantitation Limit (CRQL) (mg/kg)	Background Concentration (mg/kg)	Organic Carbon Partition Coefficient (K_{oc})[1] (L/kg)	Soil Response Action Level Based on Migration to Groundwater[2] (mg/kg) (MCL/Risk 1/Risk 2)	Risk-Based Cleanup Level[3] (Future On-Site Resident) (mg/kg)
Part A - Carcinogenic						
Tetrachloroethene*	5,900	0.01	—	363	0.036/0.0094/0.058	1.2
total PCBs[4]	8.8	0.033	—	2,630,000	26/0.20/3.2	0.0088
Benzene	361	0.01	—	100	0.010/0.0038/0.015	1.0
bis(2-Ethylhexyl)phthalate*	140	0.33	—	100,000	12/12/8,400	1.1
total CPAHs[5]	0.254	0.33	—	1,950,000	7.8/ND/ND	0.0026
PCBs (TIC Group)[4]	7.5	0.033	—	2,630,000	26/0.20/3.2	0.3
1,1,2,2-Tetrachloroethane	3.9	0.01	—	117	NA/ND/ND	0.28
Styrene	6.2	0.01	—	741	1.5/ND/ND	1.8
Trichloroethene	12.2	0.01	—	126	0.012/0.010/0.060	5.3
1,2-Dichloropropane	0.751	0.01	—	51	0.0051/ND/ND	0.44
1,2-Dichloroethane	0.97	0.01	—	19	0.0019/ND/ND	0.65
Part B - Noncarcinogenic						
Tetrachloroethene*	5,900	0.01	—	363	0.036/0.0094/0.058	250
Toluene	79,300	0.01	—	151	3.0/17/45	5,000
Ethylbenzene	6,700	0.01	—	257	3.6/2.0/2.0	1,300
bis(2-Ethylhexyl)phthalate*	140	0.33	—	100,000	12/12/8,400	130
Naphthalene	90	0.33	—	3,310	NA/9.2/860	82

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Table 6 (Continued)

Human Health Risk-Based Soil Cleanup Standards Based on Oral and Dermal Exposure: On-Site Containment Area
American Chemical Services Site
Griffith, Indiana

* Chemical appears in both Part A and Part B of table.

NA - K_{oc} or MCL not available.
ND - Chemical not detected in groundwater.

[1] Source: Montgomery, John H. Groundwater Chemicals Desk Reference, Volumes I and II. Lewis Publishers. 1991.
[2] Chemical concentration in soil at equilibrium with groundwater, when groundwater concentration is at MCL or risk-based cleanup level. Risk 1 is based on future use of upper aquifer. Risk 2 is based on current use of upper aquifer. Mathematically, Soil Response Action Level = (MCL or Risk-Based Groundwater Cleanup Level) x K_{oc} x f_{oc}. Calculation assumes 2 percent organic carbon content for site soils. If two risk-based groundwater cleanup levels were available for a chemical (i.e., carcinogenic and noncarcinogenic), the carcinogenic level was used in the calculation.
[3] Cleanup level is based either on carcinogenic risk (Part A of table) or on noncarcinogenic risk (Part B of table).
[4] K_{oc} based on Aroclor 1260.
[5] K_{oc} and MCL based on Benzo(a)pyrene.

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Table 7

Human Health Risk-Based Soil Cleanup Standards Based on Oral and Dermal Exposure: Off-Site Containment Area
American Chemical Services Site
Griffith, Indiana

Chemical	Reasonable Maximum Exposure Point Concentration (mg/kg)	CLP Low Level Contract Required Quantitation Limit (CRQL) (mg/kg)	Background Concentration (mg/kg)	Organic Carbon Partition Coefficient (K_{oc})[1] (L/kg)	Soil Response Action Level Based on Migration to Groundwater[2] (mg/kg) (MCL/Risk 1/Risk 2)	Risk-Based Cleanup Level[3] (Future On-Site Resident) (mg/kg)
Part A - Carcinogenic						
Total PCBs[4]	451	0.033	—	2,630,000	26/0.20/3.2	0.0085
Tetrachloroethene*	46,000	0.01	—	363	0.036/0.0094/0.058	1.2
total CPAHs[5]	66.8	0.33	—	1,950,000	7.8/ND/ND	0.0026
bis(2-Ethylhexyl)phthalate*	14,000	0.33	—	100,000	12/12/8,400	1.1
bis(2-Chloroethyl)ether	200	0.33	—	14	NA/1.7E-05/0.0059	0.027
1,1-Dichloroethene*	390	0.01	—	65	0.0090/ND/ND	0.098
Trichloroethene	19,000	0.01	—	126	0.012/0.010/0.060	5.3
Benzene	1,500	0.01	—	100	0.010/0.0038/0.015	1.0
1,1,2-Trichloroethane*	400	0.01	—	56.2	0.0056/ND/ND	0.52
1,2-Dichloroethane	440	0.01	—	19	0.0019/ND/ND	0.65
Aldrin*	0.898	0.0017	—	407	NA/ND/ND	0.0017
Isophorone*	3,600	0.33	—	31	NA/0.0012/2.0	7.2
Pentachlorophenol	180	0.80	—	912	0.018/0.12/0.75	0.44
Hexachlorobutadiene*	150	0.33	—	4,680	NA/ND/ND	0.38
Chloroform*	2,800	0.01	—	43.6	0.087/ND/ND	9.7
Styrene	310	0.01	—	741	1.5/ND/ND	1.7
1,2-Dichloropropane	68	0.01	—	51	0.0051/ND/ND	0.42

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Table 7 (Continued)

Human Health Risk-Based Soil Cleanup Standards Based on Oral and Dermal Exposure: Off-Site Containment Area
American Chemical Services Site
Griffith, Indiana

Chemical	Reasonable Maximum Exposure Point Concentration (mg/kg)	CLP Low Level Contract Required Quantitation Limit (CRQL) (mg/kg)	Background Concentration (mg/kg)	Organic Carbon Partition Coefficient (K_{oc})[1] (L/kg)	Soil Response Action Level Based on Migration to Groundwater[2] (mg/kg) (MCL/Risk 1/Risk 2)	Risk-Based Cleanup Level[3] (Future On-Site Resident) (mg/kg)
Hexachlorobenzene	1.92	0.33	—	34,700	0.69/ND/ND	0.019
Vinyl Chloride	2.9	0.01	—	2.5	0.0001/1.7E-06/1.3E-05	0.031
alpha-BHC	0.183	0.0017	—	1,900	NA/ND/ND	0.0047
Methylene Chloride	210	0.01	—	8.7	0.00087/0.00092/0.0016	6.4
beta-BHC	0.521	0.0017	—	3,570	NA/ND/ND	0.016
2,6-Dinitrotoluene	0.749	0.33	—	62	NA/ND/ND	0.044
4,4'-DDD	1.35	0.0033	—	43,700	NA/ND/ND	0.12
Cyclic Ketones	80	0.33	—	30.9	NA/0.0087/0.0036	7.3
4,4'-DDT	0.891	0.0033	—	1,820,000	NA/ND/ND	0.089
n-Nitrosodiphenylamine	53	0.33	—	575	NA/ND/ND	12
4,4'-DDE	0.45	0.0033	—	1,000,000	NA/ND/ND	0.16
1,4-Dichlorobenzene	5.52	0.33	—	158	0.24/0.010/1.3	2.4
Heptachlor Epoxide	0.00635	0.0017	—	20,900	0.084/ND/ND	0.0033
Part B - Noncarcinogenic						
Tetrachloroethene*	46,000	0.01	—	363	0.036/0.0094/0.058	260
2-Butanone	99,000	0.01	—	1.2	NA/0.034/0.58	620
Nitrogenated Benzenes	990	0.33	—	229	NA/ND/ND	6.2
bis(2-Ethylhexyl)phthalate*	14,000	0.33	—	100,000	12/12/8,400	13,000

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Table 7 (Continued)

Human Health Risk-Based Soil Cleanup Standards Based on Oral and Dermal Exposure: Off-Site Containment Area
American Chemical Services Site
Griffith, Indiana

Chemical	Reasonable Maximum Exposure Point Concentration (mg/kg)	CLP Low Level Contract Required Quantitation Limit (CRQL) (mg/kg)	Background Concentration (mg/kg)	Organic Carbon Partition Coefficient (K_{oc})[1] (L/kg)	Soil Response Action Level Based on Migration to Groundwater[2] (mg/kg) (MCL/Risk 1/Risk 2)	Risk-Based Cleanup Level[3] (Future On-Site Resident) (mg/kg)
4-Methyl-2-pentanone	61,000	0.01	—	6.2	NA/0.088/0.079	640
1,1,1-Trichloroethane	150,000	0.01	—	151	0.60/ND/ND	2,300
Non-Cyclic Acids	63,000	—	—	NA	—/—/—	1,000
Cadmium	1,700	1.0[6]	2.64	NA	—/—/—	52
Naphthalene	2,400	0.33	—	3,310	NA/9.2/860	86
Toluene	130,000	0.01	—	151	3.0/17/45	5,000
Ethylbenzene	23,000	0.01	—	257	3.6/2.0/2.0	1,300
Chloroform*	2,800	0.01[5]	—	43.6	0.087/ND/ND	250
Antimony	152	12[6]	9.7	NA	—/—/—	15
Methylated Naphthalenes	730	0.33	—	3,310	NA/9.2/180	85
1,1,2-Trichloroethane*	400	0.01	—	56.2	0.0056/ND/ND	51
Acetone	17,100	0.01	—	0.4	NA/0.023/0.018	2,400
Chlorobenzene	1,000	0.01	—	331	NA/1.4/1.8	150
Hexachlorobutadiene*	150	0.33	—	4,680	NA/ND/ND	25
Xylenes (mixed)	100,000	0.01	—	1,580	320/530/730	26,000
Branched Alkanes	2,300	—	—	NA	—/—/—	770
Oxygenated Benzenes	3,500	—	—	NA	—/—/—	1,200
Aldrin*	0.898	0.0017	—	407	NA/ND/ND	0.37

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Table 7 (Continued)

Human Health Risk-Based Soil Cleanup Standards Based on Oral and Dermal Exposure: Off-Site Containment Area
American Chemical Services Site
Griffith, Indiana

Chemical	Reasonable Maximum Exposure Point Concentration (mg/kg)	CLP Low Level Contract Required Quantitation Limit (CRQL) (mg/kg)	Background Concentration (mg/kg)	Organic Carbon Partition Coefficient (K_{oc})[1] (L/kg)	Soil Response Action Level Based on Migration to Groundwater[2] (mg/kg) (MCL/Risk 1/Risk 2)	Risk-Based Cleanup Level[3] (Future On-Site Resident) (mg/kg)
1,2,4-Trichlorobenzene	34.4	0.33	—	1,450	2.0/ND/ND	16
Methyl Propyl Benzenes	940	—	—	2,820	NA/24/7.9	490
1,1-Dichloroethene*	390	0.01	—	65	0.0090/ND/ND	230
Diethyl Benzenes	2,200	0.01	—	257	3.6/11/1.3	1,300
n-Chain Alkanes	1,300	—	—	NA	—/—/—	760
Propenyl Benzenes	520	—	—	NA	—/—/—	320
Di-n-butylphthalate	3,400	0.33	—	1,380	NA/97/4,700	2,300
Isophorone*	3,600	0.33	—	31	NA/0.0012/2.0	2,600
Dimethyl Ethyl Benzenes	1,700	0.01	—	257	3.6/1.3/1.3	1,300
Ethyl Methyl Benzenes	5,900	—	—	NA	—/—/—	4,900

* Chemical appears in both Part A and Part B of table.
NA - K_{oc} or MCL not available.
ND - Chemical not detected in groundwater.

1 Source: Montgomery, John H. Groundwater Chemicals Desk Reference, Volumes I and II. Lewis Publishers. 1991.
2 Chemical concentration in soil at equilibrium with groundwater, when groundwater concentration is at MCL or risk-based cleanup level. Risk 1 is based on future use of upper aquifer. Risk 2 is based on current use of upper aquifer. Mathematically, Soil Response Action Level = (MCL or Risk-Based Groundwater Cleanup Level) x K_{oc} x f_{oc}. Calculation assumes 2 percent organic carbon content for site soils. If two risk-based groundwater cleanup levels were available for a chemical (i.e., carcinogenic and noncarcinogenic), the carcinogenic level was used in the calculation.
3 Cleanup level is based either on carcinogenic risk (Part A of table) or on noncarcinogenic risk (Part B of table).
4 K_{oc} based on Aroclor 1260.
5 K_{oc} and MCL based on Benzo(a)pyrene.
6 Contract Required Detection Limit (CRDL).

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Table 8

Human Health Risk-Based Soil Cleanup Standards Based on Oral and Dermal Exposure: Site Sediment
American Chemical Services Site
Griffith, Indiana

Chemical	Reasonable Maximum Exposure Point Concentration (mg/kg)	CLP Low Level Contract Required Quantitation Limit (CRQL) (mg/kg)	Background Concentration (mg/kg)	Organic Carbon Partition Coefficient (K_{oc})[1] (L/kg)	Soil Response Action Level Based on Migration to Groundwater[2] (mg/kg) (MCL/Risk 1/Risk 2)	Risk-Based Cleanup Level[3] (Future On-Site Resident) (mg/kg)
Part A - Carcinogenic						
total CPAHs[4]	3.09	0.33	—	1,950,000	7.8/ND/ND	0.021
total PCBs[5]	4.11	0.033	—	2,630,000	26/0.20/3.2	0.068
bis(2-Chloroethyl)ether	0.361	0.33	—	14	NA/1.7E-05/0.0059	0.21
PCBs (TIC Group)[5]	4.7	0.033	—	2,630,000	26/0.20/3.2	3.9
Part B - Noncarcinogenic						
N/A						

NA - MCL not available.
ND - Chemical not detected in groundwater.
N/A - Not Applicable.

1 Source: Montgomery, John H. Groundwater Chemicals Desk Reference, Volumes I and II. Lewis Publishers. 1991.
2 Chemical concentration in soil at equilibrium with groundwater, when groundwater concentration is at MCL or risk-based cleanup level. Risk 1 is based on future use of upper aquifer. Risk 2 is based on current use of upper aquifer. Mathematically, Soil Response Action Level = (MCL or Risk-Based Groundwater Cleanup Level) x K_{oc} x f_{oc}. Calculation assumes 2 percent organic carbon content for site soils. If two risk-based groundwater cleanup levels were available for a chemical (i.e., carcinogenic and noncarcinogenic), the carcinogenic level was used in the calculation.
3 Cleanup level is based either on carcinogenic risk (Part A of table) or on noncarcinogenic risk (Part B of table). Cleanup levels for future on-site resident are equivalent to cleanup levels for current child trespasser.
4 K_{oc} and MCL based on benzo(a)pyrene.
5 K_{oc} based on Aroclor 1260.

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Table 9

Human Health Risk-Based Soil Cleanup Standards Based on Inhalation Exposure to Volatile Emissions
American Chemical Services Site
Griffith, Indiana

Chemical	Reasonable Maximum Exposure Point Concentration (mg/kg)	Source Area	CLP Low Level Contract Required Quantitation Limit (CRQL) (mg/kg)	Risk-Based Cleanup Level (mg/kg)[1]			
				Future On-Site Resident	Current Off-Site Resident	Current Worker	Current Child Trespasser
Part A - Carcinogenic							
1,1-Dichloroethene	390	Off-Site Containment Area	0.01	0.29	5.5	0.51	2.7
Carbon Tetrachloride	3,600	Still Bottoms, Treatment Lagoons	0.01	4.5	86	7.9	45
Chloroform	2,100	Still Bottoms, Treatment Lagoons	0.01	4.0	71	6.9	38
Trichloroethene	19,000	Off-Site Containment Area	0.01	260	4,400	420	2,300
Methylene Chloride	380	Still Bottoms, Treatment Lagoons	0.01	8.8	160	14	81
Benzene	361	On-Site Containment Area	0.01	12	210	19	110
Vinyl Chloride	2.9	Off-Site Containment Area	0.01	0.24	N/A	0.4	2.2
1,2-Dichloroethane	440	Off-Site Containment Area	0.01	41	N/A	64	360
Tetrachloroethene	46,000	Off-Site Containment Area	0.01	4,600	N/A	7,700	42,000
1,1,2-Trichloroethane	400	Off-Site Containment Area	0.01	150	N/A	250	N/A
bis(2-Chloroethyl)ether	110	Still Bottoms, Treatment Lagoons	0.33	80	N/A	N/A	N/A

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Table 9 (Continued)

Human Health Risk-Based Soil Cleanup Standards Based on Inhalation Exposure to Volatile Emissions
American Chemical Services Site
Griffith, Indiana

Chemical	Reasonable Maximum Exposure Point Concentration (mg/kg)	Source Area	CLP Low Level Contract Required Quantitation Limit (CRQL) (mg/kg)	Risk-Based Cleanup Level (mg/kg)[1]			
				Future On-Site Resident	Current Off-Site Resident	Current Worker	Current Child Trespasser
Part B - Noncarcinogenic							
Chloroethane	16,000	On-Site Containment Area	0.01	2,700	N/A	4,600	8,400
Non-Cyclic Acids	63,000	Off-Site Containment Area	—	8,100	N/A	14,000	25,000

N/A - Not applicable for this receptor (base risk did not exceed 10^{-6} or base HQ did not exceed 1.0).

[1] Cleanup level is based either on carcinogenic risk (Part A of table) or on noncarcinogenic risk (Part B of table). Exposure point is on-site for all receptors except Current Off-Site Resident. Exposure point for Current Off-Site Resident is off-site and downwind.

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